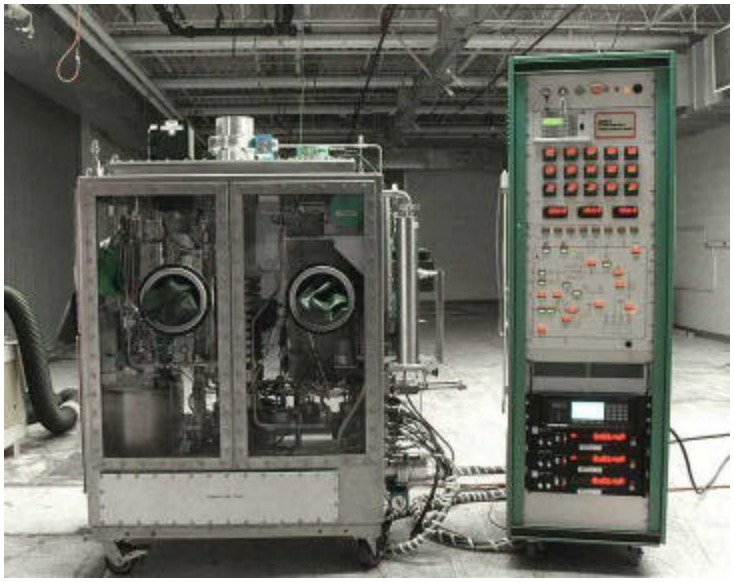
MOUND
Environmental Restoration Program

The MOUND Tritium D&D Large-Scale Demonstration and Deployment Project

# TRITIUM CLEAN-UP CART



## THE NEED

In December 1999, the U.S. Department of Energy Mound Environmental Management Project (DOE-MEMP) Office, and BWXT of Ohio, Inc. conducted a demonstration using a portable Tritium Clean-up Cart. With shutdown of facilities for the Decontamination and Decommissioning (D&D) of the Mound Site, a large number of contaminated systems, bottles, manifolds, and trailer banks need to be scrubbed of residual radioactive (and other) contaminants left in the gas phase. The cart provides a portable method to connect to and scrub components, which may or may not be connected to the Tritium Emissions Reduction Facility (TERF) System. In addition, it may be more convenient and/or expedient to use the portable clean-up system because of the presence of various catalyst "poisons" which might be harmful to the TERF.

## THE TECHNOLOGY

The innovative technology demonstrated in the Mound LSDDP was the LLNL Portable Tritium Processing System (PTPS) Clean-Up Cart. Used as a stand-alone cart for scrubbing tritium effluent, it provides a scrubbing process based on catalytic oxidation of tritium. Tritiated water is collected on removable molecular sieve dryers, which can be shipped as low level waste (LLW) below the 1080 curie "Type A" limit. Replacement and disposal of the mole sieves and the catalyst-containing reactor is easy and quick. The unit provides a projected decontamination factor of greater than 1000, with a process flow rate of 45 liters/minute. Design features include: mole sieve dryer beds configured in series with moisture monitors to prevent moisture breakthrough, Process flow controllers in the main plumbing loop and air inlet system, process thermocouples which provide process stream and enclosure over-temperature control, and an enclosure which can function as a ventilated hood during normal operating conditions but which can be isolated when tritium concentrations inside the enclosure exceed the pre-selected control setpoint.

## THE DEMONSTRATION

The demonstration applied the Tritium Clean-up Cart technology to a tritium contaminated glovebox. The plan for cleaning the glovebox included scrubbing on the box until the lowest level could be achieved and then spraying the inside to help release the tritium that was attached to the walls, equipment, tools, and other items. Performance parameters, resource allocation, and pre-and-post demonstration tritium levels were documented. Other information was collected such as technical/process difficulties and worker perception/feedback, environmental conditions, and consumable materials and waste generated.

## RESULTS

The demonstration is considered to be a success. Over the ten days of testing, the tritium levels in the glovebox were decreased from 663 micro curies/cubic meter to 205 micro curies/cubic meter after subtracting for background. Considerably more tritium was removed than is indicated because of many spray and scrub cycles. When the insides were sprayed, the tritium levels spiked to as high as 5165 micro curies/ cubic meter. Tritium levels on the last day leveled at 1640 micro curies/cubic meter. The equipment operated with no major problems and the technicians were pleased with the units operation.

This Large-Scale Demonstration & Deployment Project (LSDDP) was sponsored by the DOE Office of Science and Technology through the Deactivation and Decommissioning Focus Area managed from the National Energy Technology Laboratory in Morgantown, W.V. This demonstration is significant because it shows the effectiveness of portable tritium scrubbing equipment.

BWXT of Ohio, Inc.

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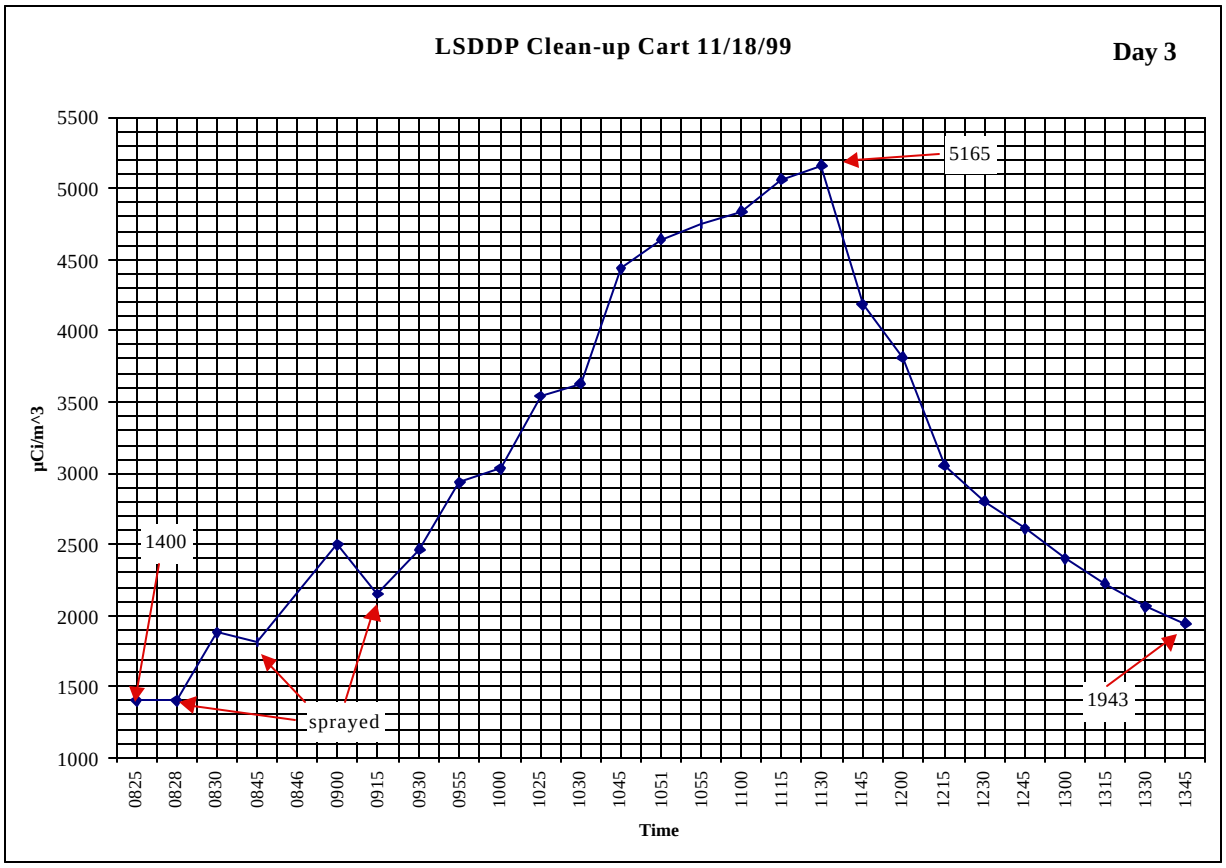
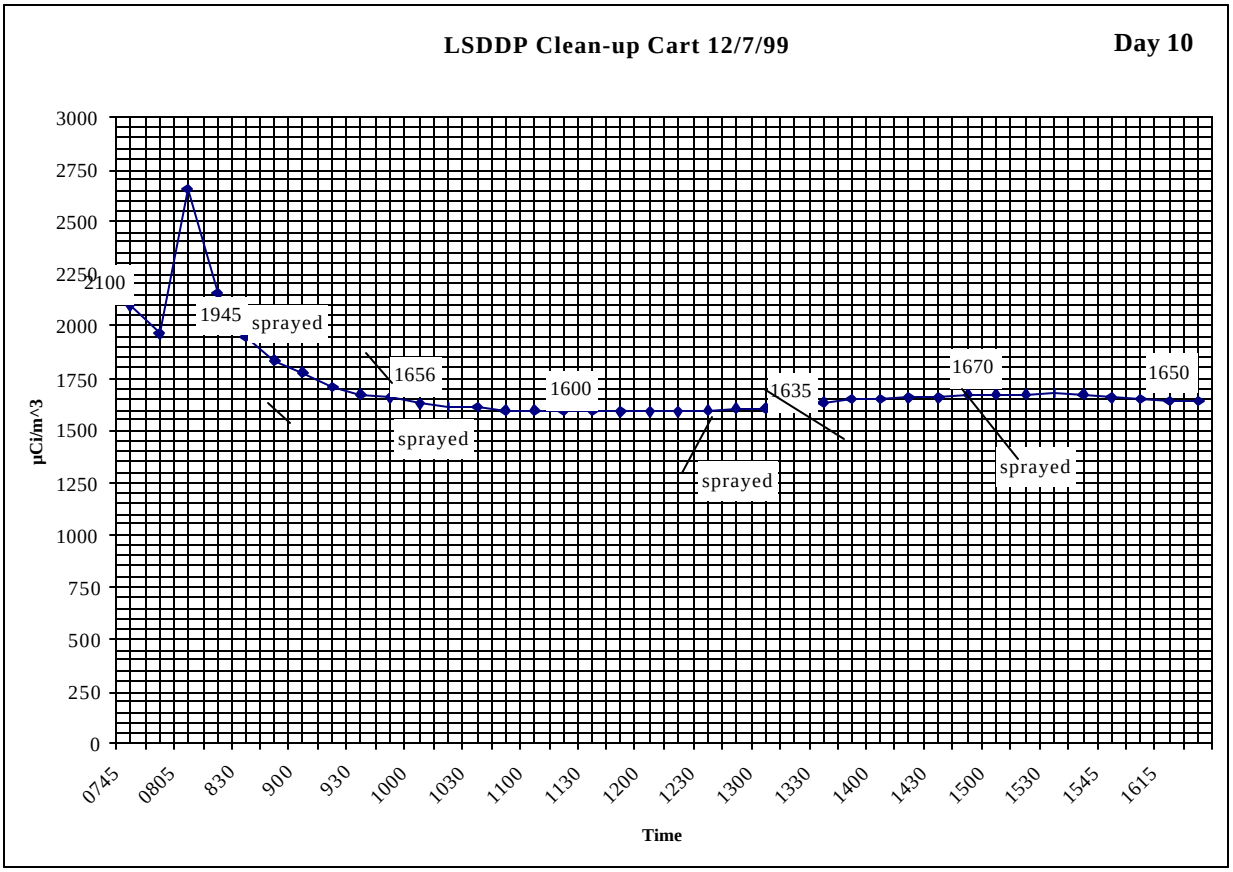

LSDDP Clean-up Cart 11/18/99
Day 3
µCi/m^3
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
1400
5165
1943
sprayed
0825
0828
0830
0845
0846
0900
0915
0930
0955
1000
1025
1030
1045
1051
1055
1100
1115
1130
1145
1200
1215
1230
1245
1300
1315
1330
1345
Time


LSDDP Clean-up Cart 12/7/99
Day 10
µCi/m^3
3000
2750
2500
2250
2100
2000
1750
1500
1250
1000
750
500
250
0
1945
sprayed
1656
sprayed
1600
1635
sprayed
1670
sprayed
1650
0745
0805
830
900
930
1000
1030
1100
1130
1200
1230
1300
1330
1400
1430
1500
1530
1545
1615
Time